

The science objectives of this flight were to 1) characterize the convective lifecycle of marine convection over the Gulf of Mexico, 2) Collect boundary layer aerosol and chemical properties in the convective region, 3) characterize the radiative properties of cirrus outflow in coordination with the ER2, 4) Collect correlative data with the A-Train during coordinated flight with the SPEC Learjet and ER2.

The initial study region was in the Central Gulf of Mexico in a region that had existing convection and that was forecast to remain convectively active throughout the flight period. The DC8 arrived on station about 30 minutes prior to the ER2 in order to characterize outflow cirrus in situ. Along the proposed ER2 coordination path, outflow cirrus appeared sparse on satellite imagery so a decision was made to fly a flight line southwestward in cirrus outflow and then join the ER2 along the coordination track when it arrived. This initial flight line to the southwest (figure 1) took the DC8 through outflow cirrus for a short period of time. Several convective cells presented themselves as targets so we continued southwestward to penetrate active turrets. This was accomplished successfully and the DC8 proceeded northeastward and joined the ER2 at the briefed waypoint.

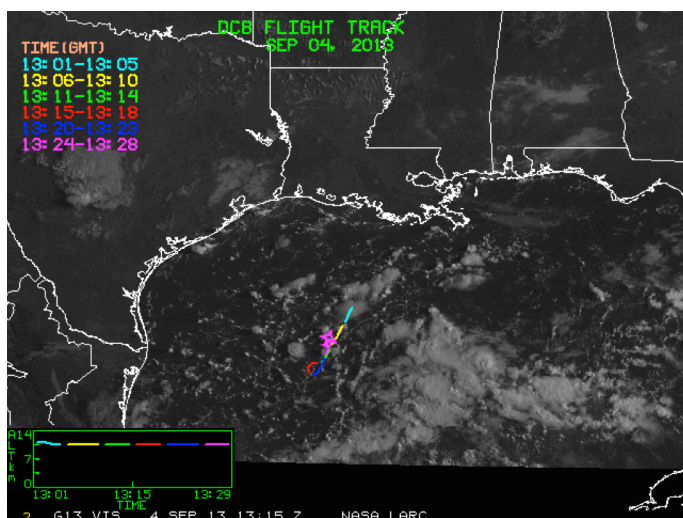


Figure 1. Southwest flight line through cirrus outflow and convective turrets prior to arrival of the ER2.

The objective was then to fly with the ER2 along the principal plane for approximately 150 km. The coordination was not optimal during the initial leg eastbound because the DC8 followed a slightly different principle plane path than the ER2. Coordination became slightly better during the westward leg and then became quite precise as the DC8 followed the ER2 eastbound again. Cirrus had variable bases with ice precipitation during these legs (Figure 2). About

midway along the 2<sup>nd</sup> eastbound coordination leg, the DC8 broke off from the ER2 because cirrus dissipated along the track. The DC8 proceeded to a clear slot and descended in a spiral to the surface. An eastbound leg at 500 feet was initiated to characterize boundary layer aerosol and chemistry. During this eastbound section, several rain showers were penetrated. Eventually, the DC8 returned westbound stepping slightly higher in order to penetrate cloud bases with marginal success because active shallow cumulus were sparse in this region. This brought the DC8

back to near the initial waypoint with the ER2. During this time, the ER2 as flying lines roughly east-west in the vicinity of the DC8.

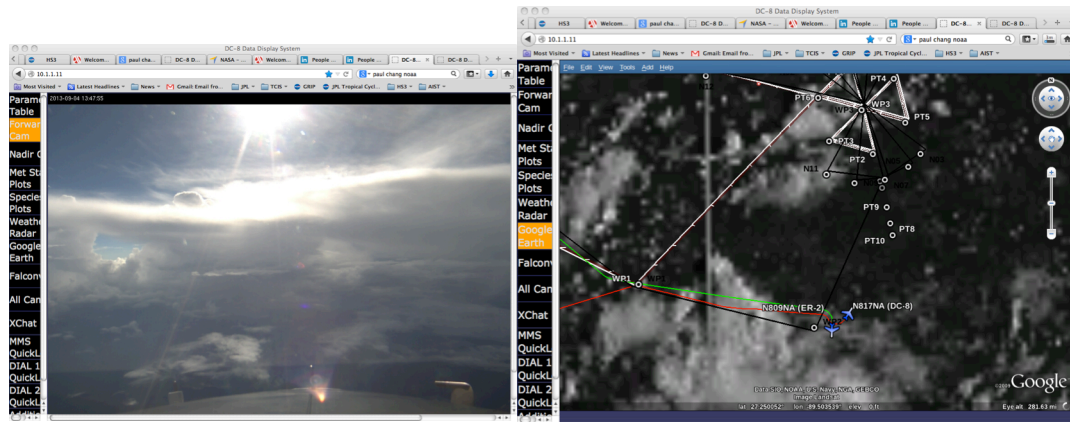


Figure 2. Cirrus outflow along the ER2 coordination track

Following the boundary layer characterization, our goal was to examine the convective lifecycle. The DC8 ascended to approximately flight level 250 and proceeded eastbound roughly along the ER2 line. Our perception on the DC8 was that the region west of the initial waypoint presented better opportunities for this objective. The region along the ER2 line was not convectively active at that time and a large convective complex seemed to exist to the south. So the DC8 proceeded westbound to near the initial waypoint with the ER2, identified targets of opportunity and began flying repeated paths along a line that ran roughly southwest to northeast. This region of convection was given the name Leilani for easy reference. Most of the cells in the Leilani complex were easily penetrated by the

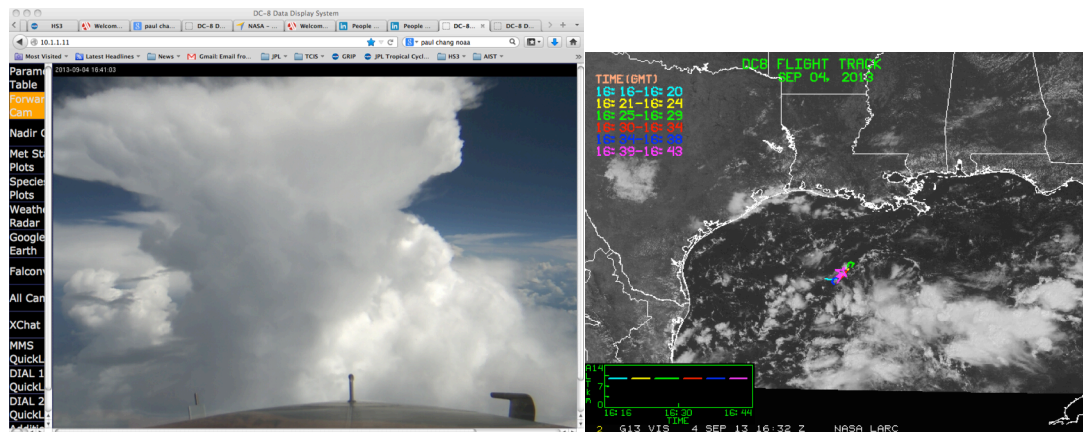


Figure 3. Convective turret penetrated in the vicinity of the Leilani convective complex.

DC8 at several altitudes (Figures 3 and 4). Based on imagery examined post flight, the Leilani complex actually was part of a much larger convective line that was propagating to the west-northwest. During this series of penetrations, the ER2

reoriented to the vicinity of the DC8 operations. The flight level of the DC8 stepped upward during this time eventually reaching FL 350 so that microphysics at different altitudes could be observed. While most of the turrets in the Leilani complex were easily penetrated by the DC8, one particularly intense cell was sampled at least twice by turning the DC8 near the convection so that the APR2 nadir radar swath could observe the properties of the convection without penetrating it with the aircraft. This cell was very near the flight line of the ER2 (Figure) during this sampling period. The Leilani complex was sampled for several hours as it progressed slowly westward. Our impression was that we characterized at least two generations of turrets. During this period, APR2 reported frequent strong return below and above the DC8. SPEC reported a wide variety of ice habits ranging from aggregates to pristine habits such as capped columns and plates. One report of graupel was noted.

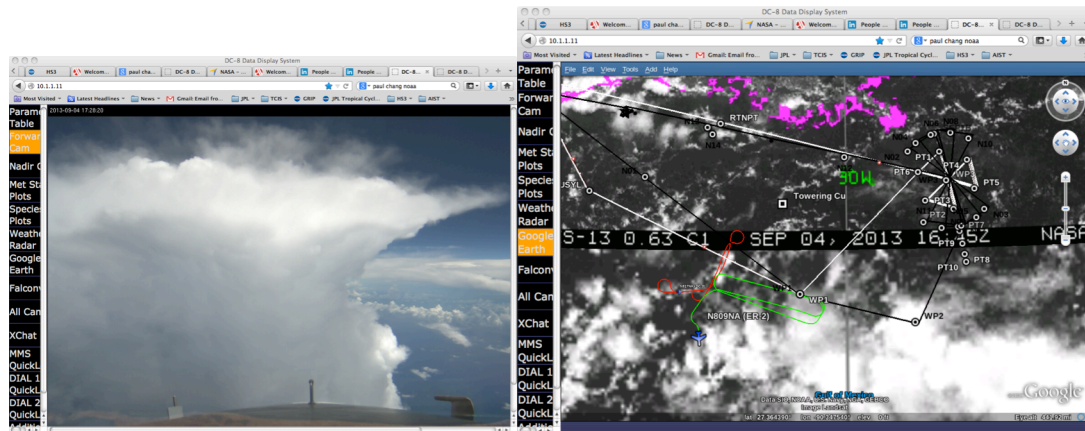


Figure 4. Another turret sampled in the Leilani convective complex and the flight lines followed by the ER2 and DC8.

Because cloud cover did not develop along the satellite track to the northeast of our main operational area, we decided not to pursue that portion of the flight. The SPEC Lear was stationed in New Orleans and a decision was made to attempt to join the DC8 and Lear (and ER2) at a point north of the Leilani complex. The exact point of this coordination evolved based on cloud conditions during the flight. However, communication between the Lear and DC8 was difficult to maintain and the cloud cover in the region was sparse. Minimal coordination between the two aircraft was achieved. The DC8 then spiraled to the surface and sampled boundary layer conditions 500 feet above the ocean surface and then penetrated fair weather cumulus on its return toward Houston.

Our preliminary assessment of the flight is that the first two goals - characterizing the lifecycle of convection, and characterizing the boundary layer properties - were achieved successfully. The third goal of coordinated flight with the ER2 to characterize the radiative heating of outflow cirrus may have been achieved but was not fully accomplished because of cloud conditions and a lack of precise

coordination with the ER2. The fourth objective of coordinating with the Lear during an A-Train overpass was not achieved.

Imagery were provided by Svetla Hristova and Rabi Polikondra